

WHAT IS CLAIMED IS:

1. A wavelength division multiplexing optical coupler comprising:
 - an input optical fiber for emitting a flux of light
 - 5 multiplexed with a plurality of wavelengths from an end face thereof;
 - a lens having a first face into which the flux of light emitted from the input optical fiber is input, and a second face from which the flux of light converted into a flux of
 - 10 parallel light is emitted;
 - a first optical filter group comprising a plurality of optical filters through which predetermined wavelength ranges of light are transmitted respectively aligned along a direction of advancing the flux of parallel light so as to be
 - 15 fixed on a side of the second face of the lens by angles different from each other relative to an optical axis of the lens such that fluxes of light in predetermined wavelength ranges included in the flux of parallel light are reflected respectively in predetermined directions; and
 - 20 a set of output optical fibers, end faces of which are arranged at positions at which fluxes of parallel light arranged by the respective optical filters of the first optical filter group are focused respectively by input into the second face and emitted from the first face of the lens;
 - 25 wherein a second optical filter group for transmitting

the predetermined wavelength ranges are arranged between the first face of the lens and the respective end faces of the set of the output optical fibers for coupling the fluxes of light reflected by the respective optical filters of the first

5 optical filter group.

2. The wavelength division multiplexing optical coupler according to Claim 1, wherein the lens is a gradient index rod lens having a first end face corresponding to the first face and a second end face corresponding to the second face and the input optical fiber and the set of the output optical fibers are held such that optical axes thereof are in parallel with each other.

15 3. The wavelength division multiplexing optical coupler according to Claim 2, wherein the optical filter of the first optical filter group arranged to a side mostly proximate to the second end face of the lens is brought into close contact with the second end face of the lens.

20

4. The wavelength division multiplexing optical coupler according to Claim 2, wherein the optical filter brought into close contact with the second end face of the lens is constituted by a dielectric multilayer film which is directly 25 formed on the end face of the lens.

5. The wavelength division multiplexing optical coupler according to Claim 2, wherein at least portions of the optical filters belonging to the second optical filter group are 5 dielectric multilayer films and are directly formed at portions of the first end face of the lens on a side opposed to an end face thereof brought into close into contact with the optical filter belonging to the first optical filter group.

10 6. The wavelength division multiplexing optical coupler according to Claim 2, wherein at least portions of the optical filters of the second optical filter group are dielectric multilayer films and are directly formed on the end faces of the respective output optical fibers.

15

7. The wavelength division multiplexing optical coupler according to Claim 2, wherein the input optical fiber and the set of the output optical fibers are held by a holding member having a plurality of fine parallel through holes along a 20 longitudinal direction thereof.

8. The wavelength division multiplexing optical coupler according to Claim 1, further comprising:
a lens having a third face from which a flux of light 25 transmitted through all of the optical filters of the first

optical filter group is input and a fourth face from which the flux of light is emitted; and

at least one of the output optical fibers an end face of which is arranged at a position of coupling the focused flux 5 of light.

9. The wavelength division multiplexing optical coupler according to Claim 8, wherein the lens is a gradient index rod lens having a third end face corresponding to the third face 10 and a fourth end face corresponding to the fourth face and the optical filter of the first optical filter group arranged to a side mostly proximate to the third end face of the lens is brought into close contact with the third end face of the lens.

15 10. The wavelength division multiplexing optical coupler according to Claim 9, wherein the optical filter brought into close contact with the third end face of the lens is a dielectric multilayer film and is formed directly on the end face of the lens.

20

11. The wavelength division multiplexing optical coupler according to Claim 9, wherein said at least one of the output optical fibers is held by a holding member having a fine through hole along a longitudinal direction thereof.

25

12. A wavelength division multiplexing optical coupler comprising:

an input optical fiber for emitting a flux of light multiplexed with a plurality of wavelengths from an end face 5 thereof;

a first lens having a first face into which the flux of light emitted from the input optical fiber is input and a second face from which the flux of light converted into a flux of parallel light is emitted; first, second and third 10 output optical fibers, two of which are provided in parallel with the input optical fiber for multiplexing / demultiplexing three wavelengths;

a first optical filter for transmitting fluxes of light having a first and a second wavelength and reflecting a flux 15 of light having a third wavelength is directly formed at an second end face corresponding to the second face of the first lens;

a second optical filter for transmitting the flux of light having the first wavelength and reflecting at least the 20 flux of light having the second wavelength, a light incident face of the second optical filter being fixed to the second end face of the first lens brought into close contact with the first filter by angles different from each other relative to the optical axis of the first lens;

25 a third output optical fiber whose end face is arranged

at a position at which the flux of light having the third wavelength reflected by the first optical filter is focused via the first lens;

5 a third optical filter for transmitting the flux of light having the third wavelength and reflecting the fluxes of light having the first and the second wavelengths is directly formed on at least one of an end face of the third output optical fiber and a first end face corresponding to the first face of the first lens opposed to the end face of the third output optical 10 fiber;

an end face of the second output optical fiber is arranged at a position at which the flux of light having the second wavelength reflected by the second optical filter is focused by the first lens via the first optical filter;

15 a fourth optical filter for transmitting at least the flux of light having the second wavelength and reflecting the flux of light having the first wavelength is directly formed on at least one of the end face of the second output optical fiber and the first end face of the first lens opposed to the 20 end face of the second output optical fiber; and

the end face of the first output optical fiber is arranged at a position at which the flux of light having the first wavelength transmitted through the first and the second optical filters is focused via a second lens.

13. The wavelength division multiplexing optical coupler according to Claim 12, wherein a third end face of the second lens on a side opposed to the first lens is provided with a predetermined angle relative to an optical axis of the second 5 lens and a second optical filter is formed directly at the end face of the second lens.

14. The wavelength division multiplexing optical coupler according to Claim 12, wherein the three wavelengths 10 respectively include wavelength ranges of 1260 through 1360 nm, 1480 through 1500 nm and 1550 through 1560 nm.

15. A wavelength division multiplexing optical coupler comprising:

15 an input optical fiber for emitting a flux of light multiplexed with a plurality of wavelengths from an end face thereof;

first, second, third and fourth output optical fibers, three of which are provided in parallel with the input optical 20 fiber for multiplexing/demultiplexing four wavelengths;

a first lens in which a first optical filter for transmitting fluxes of light having a first, a second and a third wavelength and reflecting a flux of light having a fourth wavelength is brought into contact with a second end face of 25 the first lens;

a second lens in which a second optical filter for transmitting the flux of light having the first wavelength and reflecting at least the flux of light having the second wavelength is brought into contact with a third end face of 5 the second lens; and

an optical filter chip arranged between the end faces of the first and the second lenses provided with the first and the second optical filters, the filter chip transmitting the fluxes of light having the first and the second wavelengths 10 and reflecting at least the flux of light having the third wavelength;

wherein light incident faces of the respective optical filters are respectively provided with angles different from each other relative to an optical axis of the first lens; 15 an end face of the fourth output optical fiber is arranged at a position at which the flux of light having the fourth wavelength reflected by the first optical filter is focused via the first lens;

a fourth optical filter for transmitting the flux of 20 light having the fourth wavelength and reflecting the fluxes of light having the first, the second and third wavelengths is directly formed on at least one of an end face of the fourth output optical fiber and a first end face of the first lens opposed to the end face the fourth output optical fiber;

25 the second output optical fiber is arranged at a position

at which the flux of light having the second wavelength reflected by the second optical filter is focused by transmitting through the optical filter chip and the first optical filter and focused via the first lens;

5 a sixth optical filter for transmitting at least the flux of light having the second wavelength and reflecting the flux of light having the first wavelength is directly formed on at least one of an end face of the second output optical fiber and the first end face of the first lens opposed to the end 10 face of the second output optical fiber;

the third output optical fiber is arranged at a position at which the flux of light having the third wavelength reflected by the optical filter chip is transmitted through the first optical filter and focused via the first lens;

15 the fifth optical filter for transmitting at least the flux of light having the third wavelength and reflecting the fluxes of light having the first and the second wavelengths is directly formed on at least an end face of the third output optical fiber and the first end face of the first lens opposed 20 to the end face of the third output optical fiber; and

an end face of the first output optical fiber is arranged at a position at which the flux of light having the first wavelength transmitted through the first, the second and the third optical filters is focused via the second lens.

16. The wavelength division multiplexing optical coupler according to Claim 15, wherein the optical filters for the first and the second lenses with filters are dielectric multilayer films and at least either thereof is directly formed at the 5 end face of the lens.